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SUBJECT: ENVIRONMENTAL EFFECTS OF THE TSUNAMI IN THAILAND, ONE-YEAR LATER

This is the first of a two-part report on Thailand's environmental recovery and tsunami reconstruction.

¶1. Summary. Thailand's one-year commemoration of the tsunami garnered international attention, as well as

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national introspection into the country's recovery. With the immediate needs of the humanitarian crisis attended to, academics and aid organizations have been focusing on the long-term environmental effects. Although it was created by a sea-bottom fault line, the tsunami was not an underwater disaster; it was a coastal disaster. Seagrass beds, coral reefs, and marine life, while affected by the tsunami, have proved resilient. The more significant environmental damage occurred onshore, specifically related to water resources, and this has drawn attention to long-standing practices that degrade the environment far more than the 2004 tsunami did. Some groups see this moment as an opportunity to rebuild with enviro-friendly guidelines, and Septel will discuss tsunami reconstruction, including some controversial new

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zoning regulations. This report examines the environmental effects of the tsunami in Thailand. End Summary.

UNDERWATER DEBRIS: AN "ENORMOUS AMOUNT OF JUNK"

¶2. As the waves of the tsunami receded, they swept a huge collection of land objects into the ocean with them. These items now lie buried under 1 to 1.5 meters of sand, melding with the long shallow slope of the area's underwater topography. The sand shifts with every storm and lunar cycle, re-burying and re-exposing refrigerators, televisions, box springs, and various other man-made pieces of wreckage and debris. Amcit Reid Ridgway, head of the Ecotourism Training Center (ETC) in Khao Lak, told Econoff that "there is still an enormous amount of junk" on the ocean floor. His students have been researching and collecting data on the extent of the buried matter by uncovering buried scraps and fragments during dives over the past year. The work has been painstaking, as poking around the debris stirs up the sand to near-zero visibility. ETC is fundraising for a sonar sidescan that can penetrate the sand without disturbing it.

¶3. According to Ridgway, even though the amount of debris is enormous, the highly buffered nature and sheer volume of seawater enables it to absorb and dissolve a great deal of compounds that may be released during the breakdown of the trash; the high alkalinity of seawater can neutralize polluting acids, such as battery acid. Khao Lak's open Andaman waters, with high ocean circulation, are well situated for environmental recovery. Lagoons and other poorly circulated coastal areas may suffer, however, and areas that were chemical storage sites will become dangerous if PBCs and CFCs move to nearby beaches or bio-accumulate in the food chain. Swimmers also may cut themselves on stray, sharp objects. Ridgway, as well as a marine and coastal zone specialist currently working in the Marshall Islands and experts from the Phuket Marine Biological Center, says that much more needs to be done to address the issue of underwater debris. Their suggestions include: a complete survey of the trash's chemical composition to ascertain the potential of bottom feeders introducing dangerous chemicals into the food chain; continued monitoring of the debris, especially after tidal movements and storms; and removal of as much of the debris as possible using dredging machinery, which they acknowledge would be an extremely expensive undertaking.

CORAL REEFS: TSUNAMI ONLY ONE OF THEIR DANGERS

¶4. Econoff met with a coral reef expert from the Phuket Marine Biological Center, which was part of a joint academic and governmental study that investigated 324 coral reef sites, ranging from off-shore islands to coastal-fringing reefs, within one month of the tsunami. Their study concluded that only 13 percent of the reefs suffered heavy impact; 61 percent suffered either no impact or very low impact from the tsunami. The worst coral reef destruction occurred at Koh Phi Phi Don, an island 50 kilometers southeast of Phuket where more than 1000 people died; the Surin Islands 180 kilometers north of Phuket; and Patong Bay on Phuket Island itself. A survey by a visiting team from the New England Aquarium in Massachusetts likened some of the coral reef destruction to the smoking ruins of a bombed city, as large coral heads of 4-7 meters in diameter were overturned, and transported tens of meters from their original locations. They noted, however, that even severely impacted reefs continue to support a diversity of fish fauna, with only a slight decrease in numbers of species present compared to unaffected reefs. The reef expert from the Phuket Marine Biological Center told Econoff that continuing damage from human sources - boat anchors, over-fishing, and tourism, as well as coral bleaching - present far more danger to coral reefs than the tsunami did. (Note: Coral bleaching, a damaging response by corals to environmental stress, has a variety of causes. Many scientists link the worldwide increase in coral bleaching of recent years to global warming and increased ultraviolet radiation exposure from ozone depletion. End note.)

MANGROVES: WORTH THEIR WEIGHT IN GREEN

¶5. During the tsunami, mangroves demonstrated that, as in previous storms and cyclones, they provide coastal protection by reducing wave velocity and volume. Areas with healthy mangrove cover and their associated ecosystems suffered less damage than those without mangroves, prompting more discussion among academics and government environment officials about the importance of mangrove conservation. Dr. Maitree Duangsawasdi, head of Thailand's Department of Marine and Coastal Resources was quoted in the press saying, "Mangroves in Ranong and Phang Nga saved hundreds of people. We need to plant more of them along the coastline." The tsunami damaged about 20 percent of the mangroves on

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Thailand's western coast, but like coral reefs, mangroves have and continue to be more at risk of destruction by human causes than by natural disasters. John Pernetta, an official at the United Nations Environment Programme, estimates that the cutting down of mangrove forests to make room for shrimp aquaculture farms, seaside tourist resorts, and coastal urban expansion, have resulted in a decline of up to 80 percent in mangrove coastal cover on Thailand's eastern seaboard in the past few decades.

¶6. Seagrass beds received little damage from the tsunami. A survey released by The Ministry of Natural Resources and the Environment revealed that about five percent of the Andaman Coast's seagrass area was affected, concentrated around Phang Nga province. The January 2005 survey found fast growing leaves, which were expected to replenish the area in a few months' time.

MARINE ENDANGERED SPECIES: MOSTLY UNHURT

¶7. Experts at the Phuket Marine Biological Center told Econoff that the marine mammals generally fared well in the tsunami, with the notable exception of over 1000 captive

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turtles, located at various research institutions, which were washed away. Two dolphins, one bottlenose and one unidentified, were found dead onshore, they said, adding that endangered species of the Dugong, or Sea Cow, were not affected.

FISH: HEALTHIER THAN BEFORE?

¶8. According to Dr. Maitree Duangsawasdi, the tsunami was in many ways healthy for the underwater world, acting as a kind of reset button. The turbulence unearthed new nutrients, and plankton increased temporarily, which enriched the fish and lobster. A study released by the New England Aquarium stated that the negative impact of the tsunami on coral reef fish stocks appeared to be negligible, and that the robustness of coral reef fish stocks illustrates the effectiveness of Thailand's marine sanctuaries.

OVERFISHING: "NOW EVERYONE HAS A BOAT. THEY PARK THEIR BOATS EVERYWHERE."

¶9. The above statement by a disgruntled Khao Lak villager to Econoff captures an oft-repeated sentiment that prolific post-tsunami boat-recovery assistance programs have created more fishermen than ever before. However, the problem of declining fish stocks, not only in tsunami affected waters, but in the Gulf of Thailand as well, is more attributable to illegal fishing practices by large commercial fishing boats than to any increase in the numbers of small-scale village fishermen. These boats trawl the ocean with nets that reach to the sea floors and scoop up everything in their paths. In addition, another illegal practice, "light fishing" -- using lights to attract the fish to nets at night -- is growing, according to the chairman of Save Andaman Network, a coalition of more than 50 NGOs coordinating community-based tsunami response efforts with a focus on small-scale fisherfolk and marginalized populations. He told Econoff that enforcement of laws against "light fishing" is extremely lax, partly because of the influence of certain government officials from areas in southern Thailand where the practice is common.

OCEAN WATER QUALITY: IMPROVED?

¶10. A water specialist from the Phuket Marine Biological Center expressed amazement at the results he found in post-tsunami ocean quality. Having tested the ocean water just

two weeks before the tsunami, he tested it again two weeks afterwards. Expecting high contamination levels, he instead found the quality to have improved on the bacterial level, specifically with respect to coliform bacteria originating in waste water. He hypothesizes that the bacteria bonded to the immense run-off of land sediment that occurred during the tsunami and sank to the ocean bottom along with the sediment. Samples from areas all along the western coast tested in the "good" or "very good" water quality level, with the exception of Ranong near the Burmese border, which has historical river contamination problems.

GARBAGE AND WASTE WATER: NEEDS BETTER MANAGEMENT

¶11. The lessening of coliform bacteria is likely to be only temporary. An employee at the Khao Lak garbage facility told Econoff that local inhabitants throw 20 percent of their garbage directly into the ocean and bury much of the rest, creating underground run-off further polluting the ocean. Wastewater facilities serving communities along the Andaman coast also are insufficient in number and inadequate in capacity. A representative of the NGO Thailand Environmental Institute told Econoff that the government's taxation and budget allocation structure and mechanisms are partly to blame. The budget for wastewater management is allocated to municipalities based solely on the size of the indigenous population, and do not include the significant numbers of tourists continually present in some locations. Moreover, taxes collected from the numerous tourist hotels accrue to the provincial, not municipal, governments. The result is that the demand for waste water treatment services is underestimated, and funds that could be used to address the problem are used elsewhere. The representative from the Thailand Environmental Institute said that Phang Nga province could in theory use tourist taxes to build a new wastewater treatment plant sorely needed for Khao Lak municipality, but has chosen instead to undertake a road construction project, which will likely contribute to increased tourism and further strain existing wastewater treatment facilities.

DRINKING WATER: BETTER TO BUY IT

¶12. Before the tsunami, most villagers drank tap water. Now, because of pollution of water sources and soil salinization, many tsunami-affected villages lack potable water and rely to a large extent on more expensive bottled water. Inadequate drainage and waste water systems has caused underground drinking water sources to be contaminated by the seepage of soil nitrates and phosphates, as well as by run-off from debris at construction sites. Salt, infused into the soil by the tsunami, also contaminates shallow wells. According to a water consultant with the American Red Cross, installation of reed bed filters could solve the problem, but this option may not viable in Phuket and Khao Lak as most of the land is privately owned.

SOIL SALINIZATION: THE SALT OF (OR IN) THE EARTH

¶13. The prolonged flooding of coastal lands by saltwater from the tsunami caused large amounts of salt to seep into the soil and groundwater. So far, the effects of the salinization have received little academic attention, but locals and aid workers attest that the region's ecology has changed. The extent of the damage is unknown, beyond reports of "dead areas." Farmers who formerly grew longan, durian, and rambutan in small fruit orchards in the region complain that their trees are unable to thrive and bear fruit. The options available are to either wait for the salt to dissipate, although no one knows how long that might take; or to bring in plants suitable for the now brackish soil. NOAA scientist Dr. Chip McCreery notes that the tsunami that swept over parts of Hawaii in 1957 turned

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formerly lush areas into deserts that persist 50 years later. Professors at Thailand's Prince Songkla University and Chulalongkorn University told Econoff that no one has yet conducted the research necessary to understand the effects of soil salinization on Thailand's western coast.

¶14. Comment. The underwater ocean environment suffered relatively little lasting damage from the tsunami; the major impact to the onshore environment has been the saltwater contamination of soil and drinking water sources. Continued environmentally unsustainable practices, such as over-fishing, mangrove deforestation, and unregulated urban growth along the coast, are more gradual, more insidious, and ultimately more devastating to Thailand's coastal environment than any damage from the tsunami. End comment.